

WHAT IS CLAIMED IS

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1. A circuit substrate comprising:  
a passive element; and  
an interconnection pattern,  
wherein any of said passive element and
- 10 interconnection pattern is formed by an aerosol  
deposition process that uses aerosol of a fine  
particle material.
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2. The circuit substrate as claimed in claim  
1, wherein said passive element includes at least one  
of a dielectric film, a resistance film and a
- 20 conductor film formed by an aerosol deposition process.
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3. The circuit substrate as claimed in claim  
1, wherein said circuit substrate comprises a base  
substrate and an insulation layer laminated on the  
base substrate,  
wherein at least one of the base substrate
- 30 and the insulation layer comprises a resin material.
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4. The circuit substrate as claimed in claim  
3, wherein said resin material comprises at least one  
of an epoxy resin, a polyimide resin, a polyester

resin, a fluorocarbon copolymer and a fiber glass.

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5. The circuit substrate as claimed in claim 2, wherein said dielectric film and said resistance film comprises an oxide ceramic.

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6. The circuit substrate as claimed in claim 5, wherein said dielectric film and said resistance film comprises an oxide ceramic having a perovskite structure.

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7. The circuit substrate as claimed in claim 4, wherein said conductor film includes at least one of Ag, Au, Pt, Pd, Cu and Al.

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8. The circuit substrate as claimed in claim 1, wherein said fine particle material used in said aerosol deposition process is added with or coated with an aluminum compound or a lead compound.

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9. The circuit substrate as claimed in claim 1, wherein said fine particle material comprises fine

particles having an average diameter in the range of the 10nm - 1 $\mu$ m

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10. An electron device, comprising:  
a circuit substrate including a passive  
element and an interconnection pattern; and  
10 an electronic component provided on said  
circuit substrate,  
wherein any of said passive element and  
interconnection pattern is formed by an aerosol  
deposition process that uses aerosol of a fine  
15 particle material.

20 11. A circuit substrate, comprising:  
a base substrate;  
an insulation layer formed on said base  
substrate; and  
a capacitor, said capacitor comprising a  
25 first electrode layer formed selectively on said  
insulation layer, a dielectric film at least covering  
said first electrode layer, and a second electrode  
layer formed on said dielectric film so as to oppose  
said first electrode layer,  
30 wherein at least one of said base substrate  
and insulation layer comprises a resin material, and  
wherein said dielectric layer is formed by  
an aerosol deposition process that uses aerosol of a  
fine particle material.

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12. An electron device, comprising:  
a circuit substrate; and  
an electronic component provided on said  
circuit substrate, said circuit substrate comprising:

5 a base substrate;

an insulation layer formed on said base  
substrate; and

a capacitor, said capacitor comprising a  
first electrode formed selectively on said insulation  
10 layer, a dielectric film covering at least said first  
electrode layer, and a second electrode formed on said  
dielectric film so as to oppose said first electrode  
layer,

wherein at least one of said base substrate  
15 and insulation layer comprises a resin material, and

wherein said dielectric film is formed by an  
aerosol deposition process that uses aerosol of a fine  
particle material.

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13. A method of fabricating a circuit  
substrate, said circuit substrate having any of a  
25 passive element and an interconnection pattern, said  
passive element comprising at least one of a  
dielectric film, a resistance film and a conductor  
film, said method comprising a film forming step,

said film forming step forming at least one  
30 of said dielectric film, said resistance film and said  
conductor film by ejecting aerosol of a fine particle  
material together with a carrier gas.

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14. The method as claimed in claim 13,

wherein said circuit substrate includes a base substrate and an insulation layer laminated on said base substrate,

at least one of said base substrate and said  
5 insulation layer comprises a resin material.

10 15. The method as claimed in claim 13,  
wherein said aerosol is ejected with a velocity in the  
range of 3 - 400 m/second.

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16. The method as claimed in claim 13,  
wherein said carrier gas comprises at least one of a  
helium gas, a neon gas, an argon gas and a nitrogen  
20 gas.

25 17. The method as claimed in claim 13,  
wherein said fine particle material comprises fine  
particles having an average diameter of 10nm - 1 $\mu$ m.

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18. The method as claimed in claim 13,  
wherein said resin material comprises at least one of  
an epoxy resin, a polyimide resin, a polyester resin,  
35 a fluorocarbon copolymer, and a fiber glass.

19. The method as claimed in claim 13,  
further comprising a planarizing step for planarizing  
a surface of any of said dielectric film, resistance  
film and conductor film after said film forming step.

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20. A structure including a film-like body  
formed by spraying aerosol of a fine particle material  
10 on a substrate by an aerosol deposition process,  
wherein said film-forming body contains a  
binder.

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21. The structure as claimed in claim 20,  
wherein said binder is any of an aluminum compound or  
lead compound.

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22. The structural body as claimed in claim  
25 21, wherein said aluminum compound is any of aluminum  
oxide, aluminum hydroxide, or aluminum alkoxide.

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23. The structure as claimed in claim 21,  
wherein said lead compound has a perovskite structure.

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24. The structure as claimed in claim 20,

wherein said fine particle material is any of an oxide,  
a nitride, a carbide, or a boride.

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25. The structure as claimed in claim 24,  
wherein said oxide is an oxide ceramic having a  
perovskite structure

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26. The structure as claimed in claim 20,  
15 wherein said fine particle material is formed of a  
metal.

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27. The structure as claimed in claim 20,  
wherein said film-like body has a thickness in the  
range of  $5\mu\text{m}$  - 1mm.

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28. The structure as claimed in claim 20,  
wherein said substrate is formed of a resin material,  
30 and wherein said resin material is selected from any  
of the group consisted of an epoxy resin, a polyimide  
resin, a polyester resin, a fluorocarbon copolymer and  
a fiber glass.

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29. A method of forming a structure having a film-like body by an aerosol deposition process, comprising the step of spraying a fine particle material and a binder to a substrate.

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30. The method as claimed in claim 29,  
10 wherein said binder is an aluminum compound or a lead compound.

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31. The method as claimed in claim 29,  
wherein said binder covers a surface of said fine particle material.

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32. The method as claimed in claim 29,  
wherein said binder is formed of an aluminum alkoxide  
25 having a general formula represented as  $\text{Al}(\text{OR})_3$  (R is an alkyl group), and further comprises a surface treatment process of said fine particle material by using aluminum alkoxide having a general formula represented as  $\text{Al}(\text{OR})_3$  (R is an alkyl group) before  
30 said spraying step.

33. The method as claimed in claim 32,  
35 further comprising, after said surface treatment process, the step of baking and converting said



aluminum alkoxide into an aluminum oxide film.

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34. The method as claimed in claim 29,  
wherein said binder is an aluminum oxide film, and  
wherein said aluminum oxide film is formed on the  
surface of said fine particle material by using a CVD  
10 process before said spraying process.

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35. The method as claimed in claim 29,  
wherein said binder is a particulate material and  
wherein there is provided a step of mixing said fine  
particle material and said binder.

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36. The method as claimed in claim 29,  
wherein said binder is a particulate material and  
25 wherein said fine particle material and said binder  
are sprayed from respective, different nozzles in said  
spraying process.

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37. The method as claimed in claim 29,  
wherein said fine particle material and said binder  
are used with a ratio (fine particle material: binder)  
35 of 99.9:0.1 - 50:50 in terms of mass.

38. A circuit substrate comprising an interlayer insulation film and a conductor laminated thereon,

said interlayer insulation film being  
5 deposited by spraying a fine particle material in the form of aerosol,

said conductor layer forming a continuous film of a metal or an alloy.

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39. The circuit substrate as claimed in claim 38, wherein said fine particle material  
15 comprises a ceramic including at least one of  $\text{Al}_2\text{O}_3$ ,  $\text{MgO}$ ,  $\text{SiO}_2$ ,  $\text{CaO}$ ,  $\text{TiO}_2$ ,  $3\text{Al}_2\text{O}_3 \cdot 2\text{SiO}_2$ ,  $\text{MgO} \cdot \text{Al}_2\text{O}_3$ ,  $2\text{MgO} \cdot \text{SiO}_2$ ,  $2\text{Al}_2\text{O}_3 \cdot 2\text{MgO} \cdot 5\text{SiO}_2$ ,  $\text{CaO} \cdot \text{Al}_2\text{O}_3 \cdot 2\text{SiO}_2$ ,  $\text{BaTiO}_3$ ,  $\text{BaSrTiO}_3$ ,  $\text{BaTiZrO}_3$ ,  $\text{BaTi}_4\text{O}_9$ ,  $\text{Ba}_2\text{Ti}_9\text{O}_{20}$ ,  $\text{Ba}(\text{Mg}_{1/3}\text{Ta}_{2/3})\text{O}_3$ ,  $\text{Ba}(\text{Zn}_{1/3}\text{Ta}_{2/3})\text{O}_3$ ,  $\text{Ba}(\text{Zn}_{1/3}\text{Nb}_{2/3})\text{O}_3$ ,  $\text{ZrSnTiO}_4$ ,  $\text{PbZrTiO}_3$ ,  
20  $\text{Pb}(\text{Mg}_{1/3}\text{Nb}_{2/3})\text{O}_3$ ,  $\text{Pb}(\text{Ni}_{1/3}\text{Nb}_{2/3})\text{O}_3$  and  $\text{AlN}$ .

40. A circuit substrate as claimed in claim 38, further comprising a filter, said filter comprising said interlayer insulation film and a conductor layer patterned on said interlayer insulation film.

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41. The circuit substrate as claimed in claim 38, further comprising a capacitor provided in or on said circuit substrate, said capacitor comprising plural electrode layer and a dielectric

layer formed between said electrode layers,  
said dielectric layer being deposited by  
spraying aerosol of another fine particle material by  
an aerosol deposition process.

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42. The circuit substrate as claimed in  
10 claim 41, wherein said another fine particle material  
is a ceramic including at least one of  $\text{TiO}_2$ ,  $\text{BaTiO}_3$ ,  
 $\text{BaSrTiO}_3$ ,  $\text{BaTiZrO}_3$ ,  $\text{BaTi}_4\text{O}_9$ ,  $\text{Ba}_2\text{Ti}_9\text{O}_{20}$ ,  $\text{Ba}(\text{Mg}_{1/3}\text{Ta}_{2/3})\text{O}_3$ ,  
 $\text{Ba}(\text{Zn}_{1/3}\text{Ta}_{2/3})\text{O}_3$ ,  $\text{Ba}((\text{Zn}_{1/3}\text{Nb}_{2/3})\text{O}_3$ ,  $\text{ZrSnTiO}_4$ ,  $\text{PbZrTiO}_3$ ,  $\text{Pb}$   
 $(\text{Mg}_{1/3}\text{Nb}_{2/3})\text{O}_3$  and  $\text{Pb}(\text{Ni}_{1/3}\text{Nb}_{2/3})\text{O}_3$ .

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43. The circuit substrate as claimed in claim 38,  
20 wherein any of said conductor layer and electrode  
layer contains one of Cu, Ag, Au and Al.

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44. A passive component, comprising  
lamination of a dielectric layer and a conductor layer,  
said dielectric layer being formed by  
spraying aerosol of fine particle material,  
30 said conductor layer comprising a continuous  
film of a metal or an alloy,  
said fine particle material comprising at  
least one of  $\text{Al}_2\text{O}_3$ ,  $\text{MgO}$ ,  $\text{SiO}_2$ ,  $\text{CaO}$ ,  $\text{TiO}_2$ ,  $3\text{Al}_2\text{O}_3 \cdot 2\text{SiO}_2$ ,  
 $\text{MgO} \cdot \text{Al}_2\text{O}_3$ ,  $2\text{MgO} \cdot \text{SiO}_2$ ,  $2\text{Al}_2\text{O}_3 \cdot 2\text{MgO} \cdot 5\text{SiO}_2$ ,  $\text{CaO} \cdot \text{Al}_2\text{O}_3 \cdot$   
35  $2\text{SiO}_2$ ,  $\text{BaTiO}_3$ ,  $\text{BaSrTiO}_3$ ,  $\text{BaTiZrO}_3$ ,  $\text{BaTi}_4\text{O}_9$ ,  $\text{Ba}_2\text{Ti}_9\text{O}_{20}$ ,  
 $\text{Ba}(\text{Mg}_{1/3}\text{Ta}_{2/3})\text{O}_3$ ,  $\text{Ba}(\text{Zn}_{1/3}\text{Ta}_{2/3})\text{O}_3$ ,  $\text{Ba}(\text{Zn}_{1/3}\text{Nb}_{2/3})\text{O}_3$ ,  
 $\text{ZrSnTiO}_4$ ,  $\text{PbZrTiO}_3$ ,  $\text{Pb}(\text{Mg}_{1/3}\text{Nb}_{2/3})\text{O}_3$ ,  $\text{Pb}(\text{Ni}_{1/3}\text{Nb}_{2/3})\text{O}_3$  and

AlN.

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45. An electron device comprising:

a circuit substrate in which an interlayer insulation film and a conductor layer are laminated; and

10 an electronic component provided on said circuit substrate,

said interlayer insulation film being deposited the by spraying aerosol of a fine particle material,

15 said conductor layer forming a continuous film of a metal or alloy.

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46. An electron device comprising a substrate and a passive component provided on said substrate, said passive component comprising lamination of a dielectric layer and a conductor layer,

25 said dielectric layer being formed by spraying aerosol of a fine particle material,

said conductor layer forming a continuous film of metal or alloy,

30 said fine particle material including at least one of  $\text{Al}_2\text{O}_3$ ,  $\text{MgO}$ ,  $\text{SiO}_2$ ,  $\text{CaO}$ ,  $\text{TiO}_2$ ,  $3\text{Al}_2\text{O}_3 \cdot 2\text{SiO}_2$ ,  $\text{MgO} \cdot \text{Al}_2\text{O}_3$ ,  $2\text{MgO} \cdot \text{SiO}_2$ ,  $2\text{Al}_2\text{O}_3 \cdot 2\text{MgO} \cdot 5\text{SiO}_2$ ,  $\text{CaO} \cdot \text{Al}_2\text{O}_3 \cdot 2\text{SiO}_2$ ,  $\text{BaTiO}_3$ ,  $\text{BaSrTiO}_3$ ,  $\text{BaTiZrO}_3$ ,  $\text{BaTi}_4\text{O}_9$ ,  $\text{Ba}_2\text{Ti}_9\text{O}_{20}$ ,  $\text{Ba}(\text{Mg}_{1/3}\text{Ta}_{2/3})\text{O}_3$ ,  $\text{Ba}(\text{Zn}_{1/3}\text{Ta}_{2/3})\text{O}_3$ ,  $\text{Ba}(\text{Zn}_{1/3}\text{Nb}_{2/3})\text{O}_3$ ,  $\text{ZrSnTiO}_4$ ,  $\text{PbZrTiO}_3$ ,  $\text{Pb}(\text{Mg}_{1/3}\text{Nb}_{2/3})\text{O}_3$ ,  $\text{Pb}(\text{Ni}_{1/3}\text{Nb}_{2/3})\text{O}_3$  and AlN.

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47. A fabrication method of a circuit substrate in which an interlayer insulation film and a conductor layer are laminated, comprising the steps of:

5                   forming said interlayer insulation film by spraying aerosol of a fine particle material together with a carrier gas; and

                  forming said conductor layer while depositing a metal or an alloy thereon.

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48. The method as claimed in claim 47,  
15 wherein said step of forming said conductor layer is conducted by using any of a non-electrolytic plating process, an electrolytic plating process, a sputtering process, a vacuum evaporation deposition process and a CVD process

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49. The method as claimed in claim 47,  
25 further comprising the step of forming an connection hole in said interlayer insulation film by using a hydrofluoric acid while masking said interlayer insulation film.